Field Equipment **RESEARCH REPORT**

Precision Tillage Equipment

Goal: Design, develop and test soil compaction and moisture profile sensors and integrate to Global Positioning System.

Technology Path: With the development of the soil compaction/moisture sensor, the researchers will demonstrate the relationship between infiltration variability, soil compaction, and moisture profile variability. In addition, irrigation uniformity and yield variability will also be demonstrated. This project will develop ideas and techniques to enhance irrigation uniformity, conserve water, and reduce pumping energy requirements.

At the completion of this task the researchers expect to complete the development and field verification of a soil compaction and moisture profile sensor and show its usefulness in mapping infiltration variability and managing irrigation uniformity. In addition, the researchers will have developed techniques to enhance irrigation uniformity, conserve water, and reduce pumping energy costs. Before commercialization can be realized, the researchers will need to demonstrate these methods at selected farm sites.

Energy Efficiency Benefits: Potential energy benefits to be gained from this research are at least 10% savings in water resulting in 3.25 trillion Btu/per year or the equivalent of 952 million kWhr/yr as a result of water conservation using the soil compaction and moisture sensor technology for irrigation.

Technical Objectives:

- To develop a soil compaction and moisture profile sensor and integrate it with the GPS system,
- To conduct field tests to evaluate the effectiveness of this sensor in determining the soil compaction and moisture profile,
- To conduct extensive filed tests to relate soil compaction and moisture variability to infiltration variability and yield variability,
- To evaluate the effect of infiltration variability on irrigation uniformity and its implication on irrigation management.

Economic Objectives:

Achieve sufficient energy and other production-cost savings to reach a positive return on investment for the proposed technology system.

Principal Investigator:

Dr. Shrini Upadhyaya, researcher with the University of California, Davis is the project manager.